TENTATIVE NPDES PERMITTING OPTIONS
SACRAMENTO REGIONAL COUNTY SANITATION DISTRICT
SACRAMENTO REGIONAL WASTEWATER TREATMENT PLANT

Due to the complexity and controversy of the Sacrament Regional County Sanitation District (SRCSD) NPDES Permit, a number of alternative discharge limitations are being considered, and are presented for public review and comment. Four areas of alternatives are being considered: Dilution and Mixing Zones, Disinfection, Ammonia Removal, and Nitrate Removal. The alternatives will allow for a broader range of public comment on the tentative Permit and will allow the Central Valley Regional Water Quality Control Board (Central Valley Water Board) a broad range of alternatives to consider in adoption of the permit.

The following is a brief description of the issues and the alternatives being considered. A description of the alternative that is incorporated into the tentative NPDES Permit is followed by one or more alternatives that are provided for public comment. The proposed effluent limits associated with each of these options are presented in Tables 1-4, at the end of the document.

We encourage comments on any or all of the alternatives described below.

I. Dilution and Mixing Zones

State and Federal regulations allow consideration of dilution in establishing effluent limits. If dilution is allowed, the discharge does not have to meet water quality standards at the point of discharge, but water quality standards must be met in the river after some mixing of effluent and river water has occurred. The part of the river where mixing occurs and water quality objectives are not met is termed the "mixing zone". Within the mixing zone water quality standards are not met, so there could be an impact to organisms if the organisms stayed in the mixing zone long enough. Effluent limitations and the size and shape of the mixing zone are set to prevent impacts on aquatic life and other beneficial uses. There are several criteria that must be met before a mixing zone can be granted, as described in the Fact Sheet. SRCSD has conducted extensive studies of dilution available in the Sacramento River and the size and shape of the possible mixing zones. Central Valley Water Board staff believe the alternative mixing zones being considered in this permit renewal meet the required technical criteria, however, granting of mixing zones is discretionary and need not be granted even if all technical criteria are met.

The tentative NPDES permit proposes to grant dilution for chronic aquatic life criteria and human health criteria (see Section IV.C.2 of the Fact Sheet). Three alternative permitting options for dilution are presented for comment, although other alternatives are possible. Table 1, below, compares proposed effluent limitations for constituents with reasonable potential for the various dilution alternatives versus the proposed effluent limits contained in the tentative NPDES permit.

Dilution Alternative 1 - no dilution granted. This alternative does not allow any mixing zones, so all water quality criteria must be met at the "end of the pipe." This will result in the most stringent water quality-based effluent limits being considered, and

result in the lowest discharge of waste materials to the river. However, because of the increased levels of treatment needed to achieve these effluent limits, the costs of treatment, usage of chemicals and power, and generation of sludge is greatest for this alternative.

Dilution Alternative 2 - dilution granted for human carcinogen criteria only. Due to concerns with health of the Delta ecosystem (e.g., the pelagic organism decline) it may be appropriate to not allow dilution for chronic aquatic life criteria. In this alternative, dilution is only granted for human carcinogen criteria. There are a number of chemicals in the effluent that are considered to be human carcinogens, including chemicals that are formed during the chlorine disinfection process. Water quality criteria for these chemicals protect against a one-in-one-million risk of developing cancer if a person consumes two liters of water per year containing that concentration of the chemical for 70 years. Not granting this dilution would require the SRCSD to change from chlorine disinfection to another disinfection technology – probably disinfection with Ultraviolet light (UV), which may also require installation of tertiary filtration to ensure the effluent turbidity is low enough to allow the UV disinfection process to work properly. The mixing zone for human carcinogens is approximately three miles long, but there are no drinking water intakes within the mixing zone, so there are no expected human health impacts from granting this dilution. Under this alternative, no dilution is allowed for chemicals that could impact aquatic life.

Dilution Alternative 3 - dilution granted for human carcinogen criteria, chronic aquatic life criteria, and acute aquatic life criteria. This alternative adds the allowance of a mixing zone for acute aquatic life criteria to the option presented in the tentative NPDES permit. An acute toxicity impact is the death of the organism. Although an acute mixing zone may be allowed, the SIP requires that the mixing zone be appropriately sized to prevent lethality to organisms passing through the mixing zone. USEPA recommends that float times through a mixing zone less than 15 minutes ensures that there will not be lethality to passing organisms. The acute mixing zone proposed in this alternative extends 60 feet downstream from the outfall. Based on a minimum river velocity of 0.35 feet/sec, the minimum float time is 2.8 minutes.[1] Furthermore, the proposed permit includes an acute toxicity effluent limitation that requires compliance to be determined based on acute bioassays using 100% effluent.

II. Disinfection

Wastewater contains human disease causing organisms (pathogens). Significant percentages of pathogens are removed through treatment of the wastewater, but for discharges of treated wastewater where there is the potential for human contact, such as SRCSD's discharge to the Sacramento River, a separate disinfection step is needed. How much disinfection is needed depends on the degree and type of potential public

[1] Memorandum from Larry Walker Associates to SRCSD, Mixing Zones and Prevention of Acutely Toxic Conditions, dated 13 July 2009.

exposure that exists. Because SRCSD discharges wastewater at the bottom of the river, direct human contact with undiluted effluent is unlikely, so dilution can be considered.

SRCSD worked with Central Valley Water Board staff and Department of Public Health staff to evaluate the illness and infection risk to humans contacting Sacramento River water downstream of the SRCSD discharge. The Discharger engaged the professional services of Dr. Charles Gerba of the University of Arizona to conduct the human health risk assessment. Dr. Gerba's "Estimated Risk of Illness from Swimming in the Sacramento River", 23 February 2010, concluded that the SRWTP discharge did not exceed the USEPA's water quality criteria for contact recreation. The California Department of Public Health (DPH), however, concluded that available data and the risk assessment indicates an unacceptable risk of infection from *Cryptosporidium* and *Giardia,* and has recommended reduction of health risk. The DPH specifically recommended improvements in the SRCSD disinfection system, a statistical minimum of a one log removal of *Cryptosporidium* and *Giardia,* resulting in a 1 in 10,000 risk. SRCSD and the DPH are not in agreement on the interpretation of risk assessment results.

The tentative NPDES permit requires Title 22 (or equivalent) tertiary filtration to ensure adequate disinfection to meet the pathogen removal requirements recommended by DPH (see Section IV.C.3 of the Fact Sheet). Several technologies are available to achieve this, all essentially involving filtration to produce a very low-solids effluent, which is then dosed with a disinfectant (usually chlorine, UV light or ozone/peroxide). The combination of filtration and disinfectant effectively removes virtually all pathogens. This alternative would require construction of new filtration and disinfection facilities and ongoing increased use of chemicals and/or power to provide the higher level of disinfection. The SRCSD estimated the cost for this alternative would be $1.3 billion.

Given the very high level of public contact with the receiving water, the use of the receiving water for irrigation which can result in human contact with pathogens, and extensive use of Delta waters as private and public water supplies, any increased risk of illness and infection from exposure to the wastewater is an impact to the Sacramento River's beneficial use. This alternative produces an essentially pathogen-free wastewater, which will incidentally implement DPH's recommendation to improve the level of disinfection to remove protozoa in addition to bacteria, enteric virus and other pathogens. Central Valley Water Board staff has determined that requirements of CCR Title 22 will be adequate to meet the 1 in 10,000 risk and one log removal recommended by the DPH. Filtration will also reduce heavy metals, total organic carbon, BOD, TSS and phosphorus.

One alternative for disinfection is presented for comment. Table 2, below, compares proposed effluent limitations for BOD, TSS, and total coliform organisms for the disinfection alternative versus the proposed effluent limits contained in the tentative NPDES permit.

Disinfection Alternative 1 – Existing level of disinfection. This alternative would require the same level of disinfection requirements as the existing NPDES permit. Chlorine is currently added to the wastewater as a disinfectant. Chlorine is effective at reducing threats from bacteria and enteric viruses, but has little impact on protozoa such as *Giardia* and *Cryptosporidum*. Chlorine disinfection has the disadvantage of producing trihaolomethanes and nitrosoamines as byproducts, which are human carcinogens and/or mutagens. If dilution is not allowed by the Central Valley Water Board for human carcinogens, the existing chlorine disinfection will probably have to be discontinued due to failure to meet effluent limits for trihalomethanes.

Dr. Gerba concluded that the risks from the SRWTP discharge do not exceed the 1986 USEPA's Acceptable Risk Level in its Recreational Water Quality Criteria. Further refinement of the pathogen risk study may conclude that there is no increase in risk of infection or illness from the current level of wastewater treatment, thus no change in disinfection-related effluent limitations would be required. Additional studies would be required to determine if the current disinfection facilities are adequate to meet the 1 in 10,000 risk level. At this time the minimum treatment required to reduce *Giardia* and *Cryptosporidum* to the 1 in 10,000 risk is unknown.

III. Ammonia Removal

Ammonia is naturally a part of sewage. Ammonia is a concern for wastewater discharge to surface water for four primary reasons:

- Aquatic Toxicity – fish and other aquatic organisms are harmed or killed by ammonia in sufficient concentration. USEPA has developed recommended water quality criteria for ammonia. Recent research on Delta Smelt has shown that smelt are sensitive to ammonia, but not more sensitive than fish used to develop the USEPA criteria. SRCSD's current discharge complies with USEPA ammonia criteria if a mixing zone is granted. USEPA has developed draft ammonia criteria for protection of freshwater mussels. The draft mussel criteria are significantly more stringent than the current USEPA aquatic toxicity criteria, and SRCSD cannot currently comply with the draft criteria.

- Nutrients – nitrogen is an essential nutrient to plant life. Nitrogen in ammonia is readily available for use by plants. Excessive nitrogen can contribute to excessive or changed growth in a water body, changing the ecology of the water body. Studies have shown that ammonia is inhibiting nitrogen uptake in diatoms in Suisun Bay, potentially changing the food web in Suisun Bay, a saline portion of the Bay-Delta. The overall impact of the nitrogen uptake inhibition, particularly on Delta Smelt food, is not understood. Inhibition of nitrogen uptake in freshwater portions of the Delta has not been proven.

- Dissolved Oxygen Depletion – as ammonia is consumed by organisms, and as ammonia is oxidized to nitrite and nitrate, oxygen is consumed. If the oxygen consumption rate exceeds the oxygen resources of the water body, oxygen levels can drop below receiving water objectives and adversely affect aquatic life beneficial uses. Initial SRCSD studies conclude that ammonia discharge levels may cause unacceptably low levels of dissolved oxygen in the Sacramento River downstream of the discharge. SRCSD has reduced the discharge of ammonia concentrations to reduce that risk.

- Nitrosoamines – N-nitrosodimethylamine (NDMA) is a potent mutagen and possible carcinogen and is created when nitrogenous constituents are chlorinated. The Discharger's effluent contains NDMA at levels 100 times greater than the drinking water standard. If the Central Valley Water Board does not allow a mixing zone for human health, either ammonia must be reduced or chlorination must be eliminated to meet end-of-pipe effluent limits for NDMA.

The tentative NPDES permit requires ammonia removal (i.e., full nitrification) (see Section IV.C.3 of the Fact Sheet). As discussed in detail in Attachment K of the tentative NPDES permit, full nitrification is proposed due to concerns with ammonia levels in the Delta that may be adversely affecting aquatic life beneficial uses and based on best practicable treatment or control of the discharge. This alternative would require construction of new nitrification facilities and ongoing increased use of chemicals and/or power to provide ammonia removal. The SRCSD estimated the cost for this alternative would be $800 million.

Two alternatives for ammonia removal are presented for comment. Table 3, below, compares proposed effluent limitations for ammonia for the two ammonia removal alternatives combined with dilution alternative #3 (acute and chronic dilution) and the tentative NPDES permit dilution option (chronic dilution only). Dilution alternatives #1 (no dilution) and #2 (human health dilution only) would require end-of-pipe effluent limits for ammonia, as proposed in the tentative NPDES permit. Therefore, these alternatives combined with the ammonia alternatives do not change the permitting requirements for ammonia removal presented in the tentative NPDES permit.

Ammonia Removal Alternative 1 – Ammonia reduction may not be required. This alternative proposes to include water quality–based effluent limits for ammonia based on USEPA's recommended aquatic life criteria with the possible allowance of dilution credits. Depending on the dilution alternative selected, no treatment modification or source control implementation may be required.

With a mixing zone, the current discharge complies with 1999 USEPA ammonia criteria, which protect against acute and chronic toxicity impacts to aquatic life, including Delta

Smelt[2]. Sacramento River ambient ammonia concentrations throughout the Delta are below the acute and chronic ammonia water quality criteria based on monitoring data for the Sacramento River from River Mile 44 (near two miles downstream of the discharge) to Suisun Bay[3]. Toxicity impacts from ammonia to more sensitive aquatic life, such as copepods, are continuing to be evaluated and current findings need to be confirmed before the information can be used to determine that beneficial uses are impacted.[4] The USEPA proposed ammonia criteria in 2009 for freshwater mussels that are more stringent than the USEPA 1999 ammonia criteria for salmonids. However, the 2009 ammonia criteria have not been finalized[5] and thus it would not be appropriate to use the criteria to interpret the Basin Plan's narrative toxicity objective. Experiments suggest ammonia may have synergistic or additive toxicity effects with unknown constituents in the effluent. However, according to the Discharger, the experiments conducted were not at environmentally relevant concentrations (ambient concentrations)[6]. Scientists studying the Delta have not reached a consensus on whether ammonia is either inhibiting diatom primary production or shifting algal communities[7]. Some assimilative capacity in the Sacramento River exists for oxygen demanding substances including ammonia, based on dynamic models developed for the Discharger[8].

Ammonia Removal Alternative 2 – Partial Nitrification. This alternative requires ammonia removal sufficient to reduce downstream dissolved oxygen impacts, and eliminate possible violation of the Basin Plan's water quality objective for dissolved oxygen in the Sacramento River. This would likely only require partial nitrification.

The discharge contains oxygen-demanding substances, such as ammonia and 5-day biochemical oxygen demand (BOD_5). The Basin Plan includes a water quality objective for dissolved oxygen of a minimum of 7.0 mg/L. The Discharger conducted dynamic modeling to evaluate the impacts on dissolved oxygen downstream of the discharge, and submitted a report prepared by Larry Walker Associates titled "Low Dissolved Oxygen Prevention Assessment", dated May 2010 (LDOPA Report). Based on the dynamic modeling the SRCSD determined that if acute and chronic aquatic life dilution are allowed for establishing the WQBELs for ammonia, additional ammonia controls may be necessary to ensure the discharge does not cause a violation of the Basin Plan's water quality objective for dissolved oxygen. The LDOPA Report recommends

[2] Antidegradation Analysis for Proposed Discharge Modification for the Sacramento Regional Wastewater Treatment Plant. Larry Walker Associates. May 2009.
[3] Foe, Chris, Ballard, Adam, Fong, Stephanie, "Nutrient Concentrations and Biological Effects in the Sacramento-San Joaquin Delta", July 2010.
[4] Teh, Swee, Flores, Id, Kawaguchi, Michelle, Lesmeister, Sarah and Teh, Ching. "Full Life-Cycle bioassay Approach to Assoess Chronic Exposure of Psedodiaptomus forbesi to Ammonia/Ammonium", presented at 6 July 2010 Contaminants Workshop
[5] Lisa Huff, USEPA, personal communication with Kathy Harder
[6] SRCSD response to Aquatic Issue Paper
[7] Foe, Chris, Ballard, Adam, Fong, Stephanie, "Nutrient Concentrations and Biological Effects in the Sacramento-San Joaquin Delta", July 2010.
[8] "Low Dissolved Oxygen Prevention Assessment", Larry Walker Associates, May 2010

mass loading effluent limitations for ultimate oxygen demand (UOD), which is the combined oxygen demand caused by ammonia and BOD_5. This alternative includes the UOD mass loading effluent limitations in addition to WQBELs for ammonia and technology-based effluent limits for BOD_5 (see Table 3).

The Discharger would reduce the ammonia by an amount that would meet the Basin Plan's water quality objective of 7.0 mg/L for dissolved oxygen. Partial nitrification may be problematic as it could be considered "by-passing" a treatment process which is not allowed by the Clean Water Act.

IV. Nitrate Removal

Nitrate is formed when chemicals containing nitrogen, such as ammonia, are oxidized. The SRCSD discharge currently contains very low concentrations of nitrate, however, if ammonia reduction is required, nitrates will be formed when the ammonia is oxidized (nitrified). Nitrates can be removed through a further wastewater treatment process (denitrification). Nitrates have two primary water quality concerns:

- Drinking water – excessive nitrates in drinking water can harm human fetuses and infants. If most of the ammonia is required to be removed, the resultant effluent will likely contain nitrates in excess of the State Drinking Water Standard (Primary MCL: 10 mg/L). There is sufficient dilution available in the Sacramento River that the river after mixing will not exceed the nitrate drinking water standard.

- Nutrients – nitrogen is an essential nutrient to life. Nitrogen in nitrates is readily available for use by plants. As with ammonia, excessive nitrogen can contribute to excessive or changed growth in a water body, changing the ecology of the water body. There are theories that changing the ratio of nitrogen to phosphorus can change the ecology of a waterbody, so removal of nitrogen from the effluent would keep the nitrogen to phosphorus ratio from changing, however, adverse impacts from changed nitrogen:phosphorus ratios in the Delta have not been demonstrated. The overall impact of the nitrogen on the Delta is not understood.

The tentative NPDES permit requires full denitrification of the wastewater (see Section IV.C.3 of the Fact Sheet). Full denitrification is proposed in the tentative permit to eliminate any risk of possible nitrogen impacts on the Delta and based on best practicable treatment or control of the discharge. The nitrate effluent limitation in the tentative NPDES permit has been established at the level that is technically feasible. This alternative would have the highest capital and operational costs. The Discharger has estimated the costs for full denitrification to be $170 million.

One alternative for nitrate removal is presented for comment. Table 4, below, compares proposed effluent limitations for nitrate for the nitrate removal alternative combined with

dilution alternative #1 (no dilution) and the tentative NPDES permit dilution option (chronic and human health dilution). Dilution alternatives #2 (human health dilution only) and #3 (acute, chronic, and human health dilution) allow the same level of dilution for nitrate as the tentative NPDES permit. Therefore, these alternatives combined with the nitrate removal alternatives do not change the permitting requirements for nitrate presented in the tentative NPDES permit.

Nitrate Removal Alternative 1 – Effluent Limits for Nitrate based on Primary MCL.
The tentative NPDES permit has determined that full de-nitrification is necessary to remove nitrate and nitrite to protect the aquatic life beneficial used of the Delta. If it is determined that the controlling beneficial use is municipal and domestic supply, the Primary MCL would be the objective used to develop water quality-based effluent limitations for nitrate. The WQBELs would increase from the limits proposed in the tentative NPDES permit and would be dependent on the dilution alternative selected. There is assimilative capacity in the receiving water for nitrate and dilution will assure that the river does not exceed drinking water standards for nitrates. There are no known drinking water intakes within the immediate vicinity of the discharge. The nearest drinking water intake, Freeport Water intake, is one mile upstream from the discharge. A 2006 Coordinated Operations Agreement between the Discharger and East Bay Municipal Utility District assures that no treated effluent discharge will reach the water intake. The closest drinking water intake is the Barker Slough Pumping Plant, but the percentage of effluent mixed with drinking water is unknown. The other downstream drinking water intakes that receive an average of SRWTP treated effluent of 1.25 percent mixed with their drinking water are the Contra Costa Water District Pumping Plant #1, Low Vaqueros Intake, Clifton Court Forebay-Banks Delta Pumping Plant and the City of Stockton Delta Water Supply Project Intake. The effluent will be sufficiently dilute at these intakes to meet the 10 mg/L nitrate MCL. If a dilution credit is granted for nitrate, this alternative will result in no additional requirements for nitrate removal that is currently required. If no dilution credit is allowed, then at least partial denitrification would be required if the proposed ammonia effluent limits are retained in the tentative NPDES permit, because the ammonia would be converted to nitrate and effluent concentrations would exceed end-of-pipe effluent limits based on the Primary MCL.

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Table 1: Dilution Alternatives

CONSTITUENTS		DILUTION ALTERNATIVES							
		Tentative NPDES Permit HH and Chronic		Alternative #1 No Dilution		Alternative #2 HH Only		Alternative #3 HH, Chronic, and Acute	
		AMEL	**MDEL**	AMEL	MDEL	AMEL	MDEL	AMEL	MDEL
HH Constituents									
Bis(2-ethylhexyl)phthalate	µg/L	**--**	**13**	1.8	3.4	(1)	(1)	(1)	(1)
Carbon tetrachloride	µg/L	**--**	**5.3**	0.25	0.46	(1)	(1)	(1)	(1)
Dibromochloromethane	µg/L	**--**	**2.2**	0.41	0.85	(1)	(1)	(1)	(1)
Dichlorobromomethane	µg/L	**--**	**3.4**	0.56	1.1	(1)	(1)	(1)	(1)
Dibenzo(ah)anthracene	µg/L	**0.2**	**0.4**	0.004	0.01	(1)	(1)	(1)	(1)
Methylene chloride	µg/L	**--**	**5.4**	4.7	11	(1)	(1)	(1)	(1)
N-nitrosodimethylamine (NDMA)	µg/L	**0.00069**	**0.0019**	(1)	(1)	(1)	(1)	(1)	(1)
Pentachlorohenol	µg/L	**--**	**18**	6	--	(1)	(1)	(1)	(1)
Tetrachlorethylene	µg/L	**--**	**4.4**	0.8	1.7	(1)	(1)	(1)	(1)
1,2-diphenyl hydrazine	µg/L	**0.04**	**0.08**	0.04	0.09	(1)	(1)	(1)	(1)
Manganese	µg/L	**--**	**85**	50(2)	--	(1)	(1)	(1)	(1)
Methyl tertiary butyl ether (MTBE)	µg/L	**--**	**18**	5	--	(1)	(1)	(1)	(1)
Aquatic Life Constituents									
Aluminum	µg/L	**503**	**750**	(1)	(1)	(1)	(1)	(1)	(1)
Chlorpyrifos	µg/L	**0.012**	**0.025**	(1)	(1)	(1)	(1)	(1)	(1)
Cyanide	µg/L	**--**	**11**	4.3	8.3	4.3	8.3	(1)	(1)
Copper	µg/L	**7.3**	**9.3**	(1)	(1)	(1)	(1)	(1)	(1)

(1) No change from Tentative NPDES Permit
(2) Annual average effluent limitation

Table 2: Disinfection Alternatives

CONSTITUENTS		**Tentative NPDES Permit**			Disinfection #1		
		Title 22 (or equivalent) Tertiary Req'ts			Secondary Req'ts(1)		
		AMEL	**AWEL**	**MDEL**	AMEL	AWEL	MDEL
5-day Biochemical Oxygen Demand	mg/L	**10**	**15**	**20**	30	45	60
Total Suspended Solids	mg/L	**10**	**15**	**20**	30	45	60
Total Coliform Organisms	MPN/ 100 mL	**2.2 (7-day median) 23 (once per month) 240 (instantaneous max.)**			23 (7-day median) 240 (once per month) 500 (instantaneous max.)		

(1) Turbidity specifications would be removed under Disinfection Alternative #1.

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Table 3: Ammonia Removal Alternatives with Dilution Alternatives

CONSTITUENTS		DILUTION AND AMMONIA REMOVAL ALTERNATIVES									
		Tentative NPDES Permit		Tentative Permit Dilution Ammonia #1		Dilution #3 Ammonia #1		Tentative Permit Dilution Ammonia #2		Dilution #3 Ammonia #2	
		HH and Chronic Nitrification Req'd		HH and Chronic No Nitrification		HH, Chronic, and Acute No Nitrification		HH and Chronic UOD Req'ts		HH, Chronic, and Acute UOD Req'ts	
		AMEL	**MDEL**	AMEL	MDEL	AMEL	MDEL	AMEL	MDEL	AMEL	MDEL
Ammonia (as N)	mg/L	**1.8**	**2.2**	11	13	37	47	11	13	37	47
UOD[(1)] (dry season)	lbs/day	**--**	**--**	--	--	--	--	169,000	169,000	192,000	234,000
UOD[(1)] (wet season)[(2)]	lbs/day	**--**	**--**	--	--	--	--	275,000	275,000	307,000	438,000

(1) Ultimate Oxygen Demand (UOD) = 8.34 * (1.5*BOD_5+4.6*ammonia)*Q_{eff}; BOD_5 in mg/L, ammonia in mg/L, and effluent flow (Q_{eff}) in million gallons per day.

(2) Wet season UOD set to current performance.

Table 4: Nitrate Removal Alternatives with Dilution Alternatives

CONSTITUENTS		DILUTION AND NITRATE REMOVAL ALTERNATIVES					
		Tentative NPDES Permit		Tentative Permit Dilution Nitrate #1		Dilution #1 Nitrate #1	
		HH and Chronic De-Nitrification Req'd		HH and Chronic No De-Nitrification		No Dilution No De-Nitrification	
		AMEL	**MDEL**	AMEL	MDEL	AMEL	MDEL
Nitrate (as N)	mg/L	**0.26**	**--**	127	--	10	--